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National Parks and Wildlife Service

Conservation Objectives Series

Coole-Garryland Complex SAC 000252

National Parks and Wildlife Service,
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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000252	Coole-Garryland Complex SAC
1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
3180	Turloughs*
3270	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
8240	Limestone pavements*
91J0	*Taxus baccata* woods of the British Isles*

Please note that this SAC overlaps with Coole-Garryland SPA (004107). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate. IMPORTANT: This 'Version 2' document includes 1 additional QI (1303). The conservation objectives for pre-existing QIs have not been updated.

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1992
Title :	Turloughs over 10ha - Vegetation survey and evaluation
Author :	Goodwillie, R.N.
Series :	Unpublished report to NPWS
Year :	2006
Title :	A survey of rare and scarce vascular plants in County Galway
Author :	Conaghan, J.; Roden, C.; Fuller, J.
Series :	Unpublished report to NPWS
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Ireland Red List No. 2: Non-marine molluscs
Author :	Byrne, A.; Moorkens, E.A.; Anderson, R.; Killeen, I.J.; Regan, E.C.
Series :	Ireland Red List series, NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 46
Year :	2010
Title :	Ireland Red List No. 4: Butterflies
Author :	Regan, E.C.; Nelson, B.; Aldwell, B.; Bertrand, C.; Bond, K.; Harding, J.; Nash, D.; Nixon, D.; Wilson, C.J.
Series :	Ireland Red List series, NPWS
Year :	2012
Title :	The conservation status of juniper formations in Ireland
Author :	Cooper, F.; Stone, R.E.; McEvoy, P.; Wilkins, T.; Reid, N.
Series :	Irish Wildlife Manuals, No. 63
Year :	2012
Title :	The beetles of decaying wood in Ireland. A provisional annotated checklist of saproxylic Coleoptera
Author :	Alexander, K.N.A.; Anderson, R.
Series :	Irish Wildlife Manuals, No. 65
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS

Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manuals, No. 78
Year :	2013
Title :	National survey of limestone pavement and associated habitats in Ireland
Author :	Wilson, S.; Fernandez, F.
Series :	Irish Wildlife Manuals, No. 73
Year :	2013
Title :	Results of a monitoring survey of yew woodland
Author :	Cross, J.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 72
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2015
Title :	Turlough hydrology, ecology and conservation (Part 1)
Author :	Waldren, S. (ed.)
Series :	Unpublished report to NPWS
Year :	2015
Title :	Turlough hydrology, ecology and conservation (Part 2)
Author :	Waldren, S. (ed.)
Series :	Unpublished report to NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
Author :	O Connor, Á.
Series :	Conservation objectives supporting document
Year :	2018
Title :	The Irish Juniper Monitoring Survey 2017
Author :	O'Neill, F.H.; Martin, J.R.
Series :	Irish Wildlife Manuals, No. 101
Year :	2018
Title :	The Irish Juniper Monitoring Survey 2017 - Appendices
Author :	O'Neill, F.H.; Martin, J.R.
Series :	Irish Wildlife Manuals, No. 101

Year :	2018
Title :	The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats
Author :	Martin, J.R.; O'Neill, F.H.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 102
Year :	2018
Title :	A survey of the vegetation of the Habitats Directive Annex I habitat Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (3270), in Ireland (2018)
Author :	Conaghan, J.; Fuller, J.
Series :	Unpublished report to NPWS
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2019
Title :	Checklists Protected and Threatened Species in Ireland 2019
Author :	Nelson, B.; Cummins, S.; Fay, L.; Jeffrey, R.; Kelly, S.; Kingston, N.; Lockhart, N.; Marnell, F.; Tierney, D.; Wyse Jackson, M.
Series :	Irish Wildlife Manuals, No. 116
Year :	2021
Title :	Checklists Protected and Threatened Species in Ireland. Version 2.1. 3 December 2021
Author :	Nelson, B.; Cummins, S.; Fay, L.; Jeffrey, R.; Kelly, S.; Kingston, N.; Lockhart, N.; Marnell, F.; Tierney, D.; Wyse Jackson, M.
Series :	Irish Wildlife Manuals, No. 116
Year :	2022
Title :	Bat mitigation guidelines for Ireland v2
Author :	Marnell, F.; Kelleher, C.; Mullen, E.
Series :	Irish Wildlife Manuals, No. 134
Year :	2023
Title :	The Monitoring and Assessment of four EU Habitats Directive Annex I Woodland Habitats
Author :	Daly, O.H.; O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals, No. 146
Year :	2024
Title :	Conservation objectives supporting document – Lesser Horseshoe Bat (*Rhinolophus hipposideros*) Version 2
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1932
Title :	The flora of the turloughs: a preliminary note
Author :	Praeger, R.L.
Series :	Proceedings of the Royal Irish Academy, 41B: 37-45
Year :	1966
Title :	The plant communities of the Burren Co. Clare
Author :	Ivimey-Cook, R.B.; Proctor, M.C.F.
Series :	Proceedings of the Royal Irish Academy, 64B: 211–301

Year :	1976
Title :	*Agonum livens, Asemum striatum* and *Xylota coeruliventris*: insects new to Ireland
Author :	Speight, M.C.D.
Series :	Irish Naturalists' Journal, 18: 274-275
Year :	1977
Title :	Notes on three ground beetles (Coleoptera: Carbidae) *Dyschirius luedersi* new to Ireland, *Badister peltatus* and *Chlaenius tristis* reinstated as Irish
Author :	Speight, M.C.D.
Series :	Irish Naturalists' Journal, 19(4): 116-118
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1984
Title :	The vegetation of the Coole turlough area (Western Ireland)
Author :	Louman, E.
Series :	Interne Rapporten Hugo de Vries Laboratorium Nr. 184, Universiteit van Amsterdam
Year :	1985
Title :	Phytosociological and ecological studies on turloughs in the west of Ireland
Author :	MacGowran, B.
Series :	Unpublished Ph.D. thesis, National University of Ireland, Galway
Year :	1985
Title :	The status and ecology of *Limosella aquatica* L. in Clare (H9) and south-east Galway (H15)
Author :	Curtis, T.G.F.; Ryan, J.B.; McGough, H.N.
Series :	Irish Naturalists' Journal, 21(9): 406-407
Year :	1986
Title :	A study of the geology, hydrology and geomorphology of turloughs
Author :	Coxon, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	1991
Title :	Further records of aquatic Coleoptera from Ireland
Author :	Bilton, D.T.; Lott, D.A.
Series :	The Irish Naturalists' Journal, 23(10): 389-397
Year :	1991
Title :	Records of Coleoptera from Irish wetland sites in 1989
Author :	Lott, D.A.; Bilton, D.T.
Series :	Bulletin of the Irish Biogeographical Society, 14: 60-72
Year :	1992
Title :	A review of the scarce and threatened Coleoptera of Great Britain. Part 1. UK. Nature Conservation: 3
Author :	Hyman, P.S.; Parsons, M.S.
Series :	Joint Nature Conservation Committee, Peterborough, UK
Year :	1997
Title :	An Investigation of the Flooding Problems in the Gort–Ardrahan Area of South Galway. Ecology Baseline Study. Vols I and II.
Author :	Southern Water Global and Jennings O'Donovan and Partners (eds)
Series :	The Office of Public Works

Year :	1997
Title :	Beetles (Coleoptera) recorded from various Irish sites in 1993, 1994 and 1996
Author :	Owen, J.A.
Series :	Bulletin of the Irish Biogeographical Society, 20: 136-154
Year :	1998
Title :	An investigation of the flooding problems in the Gort-Ardrahan area of South Galway. Final Report, April 1998
Author :	Southern Water Global and Jennings O'Donovan and Partners
Series :	The Office of Public Works
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2000
Title :	Flora of Connemara and the Burren - Records from 1984
Author :	Scannell, M.J.P.; Jebb, M.H.P.
Series :	Glasra, 4: 7-45
Year :	2001
Title :	Turlough pastures as a habitat for Staphylinidae and Carabidae (Coleoptera) in south-east Galway and north Clare, Ireland
Author :	Good, J.A.; Butler, F.T.
Series :	Bulletin of the Irish Biogeographical Society, 25: 74-94
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2003
Title :	Wetlands of Ireland: Distribution, ecology, uses and economic value
Author :	Otte, M.L. (ed.)
Series :	University College Dublin Press, Dublin
Year :	2003
Title :	Biological flora of the British Isles: *Taxus baccata* L.
Author :	Thomas, P.A.; Polwart, A.
Series :	Journal of Ecology, 91: 489-524
Year :	2005
Title :	An investigation of the plant, carabid, and staphylinid communities of turloughs in southeast Galway/north Clare, Ireland
Author :	Regan, E.C.
Series :	Unpublished Ph.D. thesis, National University of Ireland, Galway
Year :	2005
Title :	Further records of carabid beetles from turloughs
Author :	Regan, E.C.
Series :	Irish Naturalists' Journal, 28(2): 59–61
Year :	2005
Title :	*Thanatophilus dispar* (Herbst) (Silphidae) in turloughs in the west of Ireland
Author :	Regan, E.C.; Moran, J.
Series :	The Coleopterist, 14(2): 89-91

Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	Environmental Protection Agency, Wexford
Year :	2007
Title :	Wetland plant communities of turloughs in southeast Galway/north Clare, Ireland in relation to environmental factors
Author :	Regan, E.C.; Sheehy Skeffington, M.; Gormally, M.J.
Series :	Aquatic Botany, 87(1): 22-30
Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*
Author :	Knight, T.; Jones, G.
Series :	Endangered Species Research, 8: 79-86
Year :	2010
Title :	Modelling a network of turloughs
Author :	Gill, L.W.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	2011
Title :	The hydrology and hydroecology of turloughs
Author :	Naughton, O.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	2012
Title :	Groundwater flooding in Irish karst: The hydrological characterisation of ephemeral lakes (turloughs)
Author :	Naughton, O.; Johnston, P.M.; Gill, L.W.
Series :	Journal of Hydrology, 470-471: 82-97
Year :	2012
Title :	The influence of flood duration on the surface soil properties and grazing management of karst wetlands (turloughs) in Ireland
Author :	Kimberley, S.; Naughton, O.; Johnston, P.M.; Gill, L.W.; Waldren, S.
Series :	Hydrobiologia, 692: 29-40
Year :	2013
Title :	Modeling a network of turloughs in lowland karst
Author :	Gill, L.W.; Naughton, O.; Johnston, P.M.
Series :	Water Resources Research, 49: 3487-3503
Year :	2013
Title :	Bats and lighting: Overview of current evidence and mitigation guidance
Author :	Stone, E.L.
Series :	University of Bristol, UK

Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2016
Title :	Irish Vegetation Classification: Technical Progress Report No. 2
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2016
Title :	Quantifying the influence of surface water–groundwater interaction on nutrient flux in a lowland karst catchment
Author :	McCormack, T.; Naughton, O.; Johnston, P.M.; Gill, L.W.
Series :	Hydrology and Earth System Sciences, 20(5): 2119-2133
Year :	2018
Title :	The hydrogeology of the Gort Lowlands
Author :	Naughton, O.; McCormack, T.; Drew, D.; Gill, L.; Johnston, P.; Morrissey, P.; Regan, S.
Series :	Irish Journal of Earth Sciences, 36: 25-44
Year :	2020
Title :	An evaluation of semidistributed-pipe-network and distributed-finite-difference models to simulate karst systems
Author :	Gill, L.W.; Schuler, P.; Duran, L.; Morrissey, P.; Johnston, P.M.
Series :	Hydrogeology Journal, 29: 259–279
Year :	2021
Title :	Ecohydrological metrics for vegetation communities in turloughs (ephemeral karstic wetlands)
Author :	Bhatnagara, S.; Gill, A.; Waldren, S.; Sharkey, N.; Naughton, O.; Johnston, P.; Coxon, C.; Morrissey, P.; Ghosha, B.
Series :	Ecohydrology, DOI: 10.1002/eco.2316
Year :	2021
Title :	Impacts of climate change on groundwater flooding and ecohydrology in lowland karst
Author :	Morrissey, P.; Nolan, P.; McCormack, T.; Johnston, P.; Naughton, O.; Bhatnagar, S.; Gill, L.
Series :	Hydrology and Earth System Sciences, 25: 1923–1941

Spatial data sources

Year :	2021
Title :	Goodwillie et al. (1997) Wetland vegetation in the Gort lowlands
GIS Operations :	Goodwillie et al. map scanned and georectified. Turlough as outlined on map digitised. New turlough dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	3180 (map 3)
Year :	2019
Title :	Turloughs Database 2019
GIS Operations :	Sites identified; clipped to SAC boundary
Used For :	3180 (map 4)
Year :	2018
Title :	Irish Juniper Monitoring Survey 2017. Version 1
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	5130 (map 4)
Year :	2013
Title :	National Survey of Limestone Pavement and Associated Habitats in Ireland distribution data
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	8240 (map 5)
Year :	2018
Title :	Woodland Monitoring Survey 2017-2018
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91J0 (map 6)

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation

To maintain the favourable conservation condition of Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Little is known about the characteristics or ecology of this habitat in Ireland. It is associated with base-rich lakes, with circumneutral or higher pH, in low-lying, large, naturally more productive catchments and is characterised by high abundance and diversity of pondweeds (*Potamogeton* spp.) and mesotrophic values for total phosphorus and chlorophyll. It is not certain that the habitat occurs in this SAC, which has turloughs rather than lakes; however, areas of permanent water contain unusual macrophyte communities that may correspond to the habitat. Two measures of extent can be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015). See also the conservation objectives for habitats 3180* and 3270 in this volume
Habitat distribution	Occurrence	No decline, subject to natural processes	While it is not certain that the habitat occurs in Coole-Garryland Complex SAC, some of the typical species have been recorded from areas of permanent water within the following turloughs: Coole Lough (including the Coole River), Doo Lough and Garryland (Louman, 1984; Goodwillie, 1992). The extent to which eutrophication-tolerant species such as *Ceratophyllum demersum* and *Potamogeton pectinatus* are natural aquatic components of these turloughs is uncertain. It is possible that permanently-flooded areas naturally contained a less productive habitat, such as habitat 3140. The ecological requirements of more sensitive communities within the turloughs of this SAC, therefore, take precedence over the 3150 habitat
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessments for 3150 (NPWS, 2013, 2019) and the lake habitats supporting document (O Connor, 2015). The habitat may not be a natural component of the permanent waters within the turlough complex in this SAC; however, the aquatic species recorded include: in Garryland, *Ceratophyllum demersum, Potamogeton berchtoldii, P. perfoliatus* and *Myriophyllum alterniflorum* (Goodwillie, 1992); in Coole and Doo Loughs, *P. natans, P. pectinatus, P. perfoliatus, P. pusillus* and *Myriophyllum spicatum* (Louman, 1984; Goodwillie, 1992) and in the Coole River, *Elodea canadensis, Lemna minor, Lemna trisulca, P. perfoliatus* and *Sparganium* spp. (Louman, 1984). Jim Ryan (pers. comm.) has also recorded *P. pectinatus, P. crispus* and possibly *P. lucens* or *P.* x *angustifolius* in the SAC
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3150 (see O Connor, 2015). Zonation is likely to be limited in this SAC owing to the large fluctuations in water depth in the turloughs, as well as high water colour and turbidity

Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3150. Maximum vegetation depth is likely to be limited by basin morphology, the large fluctuations in water depth, high water colour and high turbidity in the turloughs of this SAC
Hydrological regime: water level fluctuations	Metres	Maintain appropriate hydrological regime necessary to support the habitat	The waterbodies in Coole-Garryland Complex SAC are turloughs and subject to very large natural fluctuations in water level. See the conservation objective for Turloughs* (Annex I habitat code 3180) in this volume
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that soft muddy substrata dominate habitat 3150. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Much of the substratum at Coole Lough is fine mud and becomes colonised by the Annex I habitat Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (habitat code 3270; see Conaghan and Fuller, 2018 and the conservation objective for habitat 3270 in this volume)
Transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3150 (O Connor, 2015). Habitat 3150 is associated with lower transparency than the other lake habitats. Targets for lakes are unlikely to be appropriate in the turloughs of this SAC
Nutrients	µg/l P; mg/l N	Maintain/restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	As a relatively productive habitat, mesotrophic and Water Framework Directive 'good' status targets generally apply; however, as the waterbodies in this SAC are turloughs, the water quality targets for habitat 3180 take precedence (see the conservation objective for Turloughs* (3180) in this volume). See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Phytoplankton biomass	µg/l Chlorophyll *a*	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll *a* status	Mesotrophic and Water Framework Directive 'good' status targets generally apply to habitat 3150; however, as the waterbodies in this SAC are turloughs, the water quality targets for habitat 3180 take precedence (see the conservation objective for Turloughs* (3180) in this volume). See also OECD (1982) and The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Attached algal biomass	Algal cover	Maintain/restore trace/absent attached algal biomass (<5% cover)	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in habitat 3150 should, ideally therefore, be trace/absent (<5% cover). Jim Ryan (pers. comm.) has, on occasion, observed mass algal development in the SAC
Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	The specific requirements of habitat 3150, in terms of water and sediment pH, alkalinity and cation concentration, have not been fully determined

Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be high in this SAC. It is uncertain to what extent this is natural or a result of damage and land-use activities on up-gradient peatland
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc. DOC may be artificially elevated in this SAC as a result of damage and land-use activities on up-gradient peatland
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. It must be noted, however, that habitat 3270 (Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation) is dependent on a regular supply of fine sediment and, therefore, episodes of high turbidity are considered to be a natural feature of some turloughs, e.g. Coole Lough, in the SAC
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of the habitat	Fringing habitats intergrade with and support the structure and functions of the aquatic habitat. Equally, fringing habitats depend on the permanent water, particularly its water levels, and support wetland communities and species of conservation concern. Many fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. See Mainstone et al. (2016). A wide diversity of communities and habitats fringe open water in this SAC, including other turlough communities, woodland and limestone pavement. See the other conservation objectives in this volume

3180 Turloughs*

To restore the favourable conservation condition of Turloughs* in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area of c.365.1ha stable or increasing, subject to natural processes	Coole-Garryland Complex SAC is a well-studied complex of Irish turloughs (MacGowran, 1985; Coxon, 1986; Goodwillie, 1992; Goodwillie et al., 1997 in Southern Water Global and Jennings O'Donovan and Partners, 1997; Regan, 2005; Naughton, 2011; Waldren, 2015; Conaghan and Fuller, 2018). The more well-known turloughs present within the SAC include Lydacan, Cahermore, Crannagh North, Crannagh South, Coole, Garryland, Newtown and Hawkhill. The area target is based on the approximate area of 365.1ha for Coole-Garryland Complex SAC based on data from Goodwillie et al. (1997). See map 3 for the recorded extent. Goodwillie (1992) categorised the Coole-Newtown turlough and Garryland turlough, both within the SAC, as being of international ecological importance. Garryland turlough, the sole turlough from the SAC studied by Waldren (2015), was assessed to be in unfavourable-inadequate (poor) conservation condition. See O Connor (2017) for information on all attributes and targets
Habitat distribution	Occurrence	No decline, subject to natural processes	See maps 3 and 4. Goodwillie et al. (1997) described Coole/Newtown as 'the most valuable turlough in the study area and probably in the whole country'. They stated that it has unparalleled flooded woodland, many rare species and is in unique in having three adjacent systems that operate independently for the growing season but are linked in floods. They noted that the turloughs vary significantly in substrate and trophic status from the highly eutrophic Coole to oligotrophic Newtown. Goodwillie (1992) stated that Coole/Newtown was the most diverse turlough encountered for its physiography and vegetation and 'unquestionably of international value'
Hydrological regime	Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Hydrological regime is sub-divided into more detailed attributes (groundwater contribution, flood duration, frequency, area and depth, and permanently flooded/wet areas) and targets in O Connor (2017). Coole and Garryland are part of a series of conduit-fed turloughs which includes Blackrock turlough and Lough Coy up-gradient, and Caherglassan down-gradient. The hydrology of this series is well-studied (Coxon, 1986; Goodwillie, 1992; Gill, 2010; Gill et al., 2013, 2020; Naughton, 2011; Naughton et al., 2012, 2018; Waldren, 2015; McCormack et al., 2016; Bhatnagara et al., 2021). The hydrogeology of all turloughs in the SAC was studied by Southern Water Global and Jennings O'Donovan and Partners (1998) (see also Naughton et al., 2018; Morrissey et al., 2021). Waldren (2015) assessed the hydrological regime at Garryland turlough as good
Soil type	Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota	Soil type is highly variable across the turloughs in the SAC. Goodwillie (1992) noted widespread drift material, with silt, sand and gravel, as well as marl and peat in many flatter areas of Newtown. Garryland turlough is almost entirely very shallow, or shallow, poorly-drained mineral soils (Waldren, 2015). For further information on soil types in Coole-Garryland Complex SAC, see Goodwillie (1992), Goodwillie et al. (1997), Kimberley et al. (2012) and Waldren (2015)

Soil nutrient status: nitrogen and phosphorus	N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities	Soil nutrient status varies across the turloughs in the SAC. Mean total nitrogen (TN) within the soils at Garryland turlough was 9,756mg/kg TN, which is just below the median value for the 22 turloughs studied by Waldren (2015). Mean total phosphorus (TP) at Garryland turlough was 920mg/kg TP, which is very close to the median for the 22 turloughs studied by Waldren (2015). Turloughs in the SAC with marl or peat soils, e.g. Newtown, are likely to have lower total phosphorus concentrations
Physical structure: bare ground	Presence	Maintain sufficient wet bare ground, as appropriate	See O Connor (2017) for information on all attributes and targets
Chemical processes: calcium carbonate deposition and concentration	Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	Goodwillie (1992) recorded marl at Newtown turlough. The soils sampled at Garryland turlough had a low calcium carbonate content of 5.8% (Waldren, 2015)
Active peat formation	Flood duration	Maintain active peat formation	Peat soils have been recorded within turloughs in this SAC. Goodwillie (1992) stated that peat occurs in many places on the flatter floor of Newtown turlough and that some peat occurs near the lake and spring at Garryland. Peat cutting was evident in Garryland wood and on the racecourse (Newtown) (Goodwillie, 1992). Goodwillie et al. (1997) stated that Newtown turlough has considerably more accumulation of peat than Coole. Waldren (2015) found that Garryland had a low (22.6%) mean organic matter content
Water quality	Various	Restore appropriate water quality to support the natural structure and functioning of the habitat	Water quality is sub-divided into more detailed attributes and targets in O Connor (2017). See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. Waldren (2015) found that Garryland had low alkalinity, high colour and high total phosphorus (mean 24.6µg/l TP). Mean total nitrogen was 1.1mg/l TN, and mean and maximum chlorophyll *a* were 1.1µg/l and 2.0µg/l, respectively. Extensive algal mats (>2% cover) were observed (Waldren, 2015). Turloughs in the SAC are naturally variable in trophic status. Naturally highly oligotrophic turloughs such as Newtown require ≤10µg/l TP, annual mean <2.5µg/l chlorophyll *a* and maximum ≤8µg/l chlorophyll *a* to reach favourable condition, whereas for naturally-richer conduit-fed turloughs such as Coole and Garryland, targets of ≤20µg/l TP, <8.0µg/l annual mean and <25µg/l annual maximum chlorophyll *a* should suffice. Epiphyton/algal mats should be trace/absent (<2% cover)
Vegetation composition: area of vegetation communities	Hectares	Maintain area of sensitive and high conservation value vegetation communities/units	The vegetation of the SAC is highly diverse and includes widespread communities of high conservation value. Habitat 3270 is a constituent community of the turlough habitat at Coole (see Goodwillie, 1992; Goodwillie et al., 1997; Conaghan and Fuller, 2018; and the conservation objective for habitat 3270 in this volume). For further information on the turlough vegetation communities in the SAC see, inter alia, Praeger (1932), Ivimey-Cook and Proctor (1966), Louman (1984), MacGowran (1985), Goodwillie (1992, 2003 in Otte, 2003), Goodwillie et al. (1997), Regan (2005), Regan et al. (2007), Waldren (2015)
Vegetation composition: vegetation zonation	Distribution	Maintain vegetation zonation/mosaic characteristic of the turlough	Praeger (1932) was one of the first to describe the characteristic zonation of turloughs based on survey of Hawkhill turlough. For information on the turlough vegetation communities in the SAC see, inter alia, Praeger (1932), Ivimey-Cook and Proctor (1966), Louman (1984), MacGowran (1985), Goodwillie (1992, 2003), Goodwillie et al. (1997), Regan (2005), Regan et al. (2007), Waldren (2015)

Vegetation structure: sward height	Centimetres	Maintain sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough	Goodwillie (1992) recorded grazing by cattle, sheep and horses in and around Garryland turlough and stated that overgrazing was severe in June 1990, making plants difficult to identify because of their small size. Waldren (2015) also reported that within Garryland turlough there is an absence of fencing or stone walls and the vegetation is closely cropped. Newtown turlough is grazed by cattle and sheep (Goodwilie, 1992). For information on the turlough vegetation communities in the SAC see, inter alia, Praeger (1932), Ivimey-Cook and Proctor (1966), Louman (1984), MacGowran (1985), Goodwillie (1992, 2003), Goodwillie et al. (1997), Regan (2005), Regan et al. (2007), Waldren (2015)
Typical species	Presence	Maintain typical species within the turlough	Typical species is sub-divided into more detailed attributes and targets in O Connor (2017). Rare plants are widespread in turloughs in the SAC (Goodwillie et al., 1997) and include *Callitriche palustris* (Scannell and Jebb, 2000; Goodwillie, 2003; Conaghan and Fuller, 2018) and *Potentilla fruticosa* (MacGowran, 1985), both Vulnerable in Wyse Jackson et al. (2016). The Near Threatened *Viola persicifolia* occurs, as do *Limosella aquatica* and *Rorippa islandica*. See, inter alia, Praeger (1932), Ivimey-Cook and Proctor (1966), Louman (1984), Curtis et al. (1985), MacGowran (1985), Goodwillie (1992, 2003), Goodwillie et al. (1997), Regan (2005), Conaghan et al. (2006), Regan et al. (2007), Waldren (2015) for further information on typical plant species, and for that on typical invertebrates, see inter alia, Speight, (1976, 1977), Bilton and Lott (1991), Lott and Bilton (1991), Owen (1997), Good and Butler (2001), Regan (2005), Regan and Moran (2005)
Fringing habitats: area	Hectares	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	Coole-Garryland Complex SAC is of high conservation importance for its mosaic of Annex I and other habitats, particularly the transitions and gradations between open wetland and woodland communities. See Goodwillie (1992, 2003), Goodwillie et al. (1997) and the other conservation objectives in this volume
Vegetation structure: turlough woodland	Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure	The turlough woodland in this SAC is unparalleled across Irish turloughs and is of high conservation value (Goodwillie et al., 1997). See Goodwillie (1992, 2003), Goodwillie et al. (1997), Perrin et al. (2008) and the other conservation objectives in this volume for further information on turlough woodland

3270 Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation

To restore the favourable conservation condition of Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Habitat area	Area stable, subject to natural fluctuations	Habitat 3270 is a constituent vegetation community within the turlough habitat in Coole-Garryland Complex SAC. It is relatively well-studied in Coole, Garryland and Hawkhill turloughs, and may be more widespread in the SAC. See Louman (1984), Curtis et al. (1985), Goodwillie (1992, 2003 in Otte, 2003, 2007 in NPWS, 2007), Goodwillie et al. (1997) in Southern Water Global and Jennings O'Donovan and Partners (1997), Scannell and Jebb (2000), Conaghan et al. (2006), Waldren (2015) and Conaghan and Fuller (2018) for further information. The area of habitat 3270 can vary significantly, inter-annually with flooding regime. Conaghan and Fuller (2018) recorded 27.2ha of habitat 3270 in the SAC and suggested that the maximum area may be more than 40ha. See Conaghan and Fuller (2018) for information on the habitat in Ireland and O Connor (2017) for information on all attributes and targets
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs on open muddy ground within the Coole and Garryland turloughs, with a small area also located within Hawkhill turlough (Conaghan and Fuller, 2018). See also Louman (1984), Curtis et al. (1985), Goodwillie (1992, 2003, 2007), Goodwillie et al. (1997), Scannell and Jebb (2000), Conaghan et al. (2006), Waldren (2015)
Hydrological regime	Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Hydrological regime is sub-divided into more detailed attributes (groundwater contribution, flood duration, frequency, area and depth, and permanently flooded/wet areas) and targets in O Connor (2017). Data for habitat 3270 at Coole indicate that it is continuously flooded for around 250 days/year (Owen Naughton, pers. comm.). Coole and Garryland are part of a well-studied series of conduit-fed turloughs (Coxon, 1986; Goodwillie, 1992; Gill, 2010; Gill et al., 2013, 2020; Naughton, 2011; Naughton et al., 2012, 2018; Waldren, 2015; McCormack et al., 2016; Bhatnagara et al., 2021). Water levels at Coole and Garryland exhibit a tidal influence at low water levels. The hydrogeology of all turloughs in the SAC was studied by Southern Water Global and Jennings O'Donovan and Partners (1998) (see also Naughton et al., 2018; Morrissey et al., 2021). Late drying and long hydroperiod, the supply of fine mud and the gentle slope are key to the area, structure and functioning of the habitat
Soil type	Hectares	Maintain area and extent of soil types necessary to support the habitat	The habitat is found on exposed mud in the SAC, sometimes with associated stones and rock (Goodwillie, 1992; Goodwillie et al., 1997; Conaghan and Fuller, 2018). The areas of habitat 3270 within Garryland turlough are heavily poached by cattle and horses (Conaghan and Fuller, 2018)
Soil nutrient status: nitrogen and phosphorus	N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities/units	Waldren (2015) recorded mean total nitrogen (TN) within the soils at Garryland turlough of 9,756mg/kg TN, which is just below the median value for the 22 turloughs studied. Mean total phosphorus (TP) at Garryland turlough was 920mg/kg TP, which is very close to the median for the study (Waldren, 2015). Habitat 3270 appears to be associated with relatively fertile soils

Physical structure: bare ground	Presence	Maintain sufficient wet bare ground, as appropriate	Late drying and, likely also, the deposition of fine sediment should be sufficient to maintain the bare ground required by the habitat. The levels of trampling observed in Garryland is a significant threat to the habitat (Conaghan and Fuller, 2018)
Chemical processes: calcium carbonate deposition and concentration	Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	The soils sampled at Garryland turlough had a low calcium carbonate content of 5.8% (Waldren, 2015)
Water quality	Various	Restore appropriate water quality to support the natural structure and functioning of the habitat	Water quality is sub-divided into more detailed attributes (nutrients, colour, phytoplankton and epiphyton biomass) and targets in O Connor (2017). Garryland had low alkalinity, high colour, high total phosphorus (mean of 24.6µg/l TP) and low maximum chlorophyll *a* (2.0µg/l) (Waldren, 2015). See also the conservation objective for Turloughs* (3180) in this volume
Vegetation composition: vegetation communities	Hectares	Maintain area of sensitive and high conservation value vegetation communities/units	Large areas of 3270 at Coole are dominated by an open mud surface with abundant *Limosella aquatica* and *Riccia* sp. (Conaghan and Fuller, 2018). *Callitriche palustris* and *Gnaphalium uliginosum* are locally frequent. This vegetation was very sparse and low-growing (<2cm) and no grazing or poaching by livestock were noted by Conaghan and Fuller (2018). Habitat 3270 at Garryland turlough is characterised by the low growing rush *Eleocharis acicularis*, cover of which often exceeds 50%; associated species generally have a low cover and include *L. aquatica* and *C. palustris* (Conaghan and Fuller, 2018). Areas of Garryland are heavily grazed and poached by cattle and horses posing a significant threat to the habitat in this part of the SAC (Conaghan and Fuller, 2018). See also Louman (1984), Curtis et al. (1985), Goodwillie (1992, 2003, 2007), Goodwillie et al. (1997), Scannell and Jebb (2000), Conaghan et al. (2006) and Waldren (2015)
Vegetation composition: vegetation zonation	Distribution	Maintain vegetation zonation/mosaic characteristic of the site	See Louman (1984), Curtis et al. (1985), Goodwillie (1992, 2003, 2007), Goodwillie et al. (1997), Scannell and Jebb (2000), Conaghan et al. (2006), Waldren (2015) and Conaghan and Fuller (2018) for information the vegetation of 3270 in the SAC
Typical species	Presence	Maintain typical species	Typical plant species and targets are provided in the Article 17 habitat assessment for 3270 (NPWS, 2019). See also Conaghan and Fuller (2018) and O Connor (2017). See Louman (1984), Curtis et al. (1985), Goodwillie (1992, 2003, 2007), Goodwillie et al. (1997), Scannell and Jebb (2000), Conaghan et al. (2006), Waldren (2015) and Conaghan and Fuller (2018) for records of typical 3270 species in the SAC, which include *Callitriche palustris*, listed as Vulnerable in Wyse Jackson et al. (2016), *Limosella aquatica* and *Rorippa islandica*
Fringing habitats: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of the habitat	Habitat 3270 within Coole-Garryland Complex SAC is immediately fringed by other turlough communities. At Coole, the fringing vegetation tends to be dominated by species-rich marsh with *Filipendula ulmaria, Potentilla anserina, Carex flacca, Anthoxanthum odoratum, Galium boreale* and *Briza media* (Conaghan and Fuller, 2018). Within Garryland turlough, the fringing habitats include an *Agrostis stolonifera-Ranunculus repens* community and the fen community *Carex nigra-Potentilla anserina* (Waldren, 2015). At the Hawkhill turlough, most of the vegetation adjoining habitat 3270 is dominated by *Eleocharis palustris* swamp (Conaghan and Fuller, 2018). See also Louman (1984), Goodwillie (1992) and Goodwillie et al. (1997)

5130 *Juniperus communis* formations on heaths or calcareous grasslands

To restore the favourable conservation condition of *Juniperus communis* formations on heaths or calcareous grasslands in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	As part of the Irish Juniper Monitoring Survey (O'Neill and Martin, 2018), *Juniperus communis* formations on heaths or calcareous grasslands was surveyed and mapped in the sub-site Tirneevin (site code GY07) in Coole-Garryland Complex SAC to give a total estimated area of 11.56ha. See map 5. This is judged to be a minimum area. The habitat occurs in association with Limestone pavements* (habitat code 8240), Turloughs* (3180), scrub and heath. Owing to the large extent of Coole-Garryland Complex SAC, there may be other areas of the habitat in the SAC that have not been surveyed
Habitat distribution	Occurrence	No decline, subject to natural processes. Surveyed location shown on map 5	Distribution is based on O'Neill and Martin (2018). The habitat forms three discrete areas of juniper (*Juniperus communis*) shrubs in the Tirneevin sub-site (GY07) in the SAC. It is important to note that further unsurveyed areas of the habitat may be present within the SAC
Juniper formation size	Number and proximity of juniper plants	At least 50 juniper plants present with each plant separated by no more than 20m	Attribute and target based on O'Neill and Martin (2018). A juniper formation is defined by O'Neill and Martin (2018) as any cluster of ≥50 juniper plants where no plant is more than 20m from another. In practice, this means that juniper plants should achieve a minimum density of 25 plants per hectare to qualify as a formation. O'Neill and Martin (2018) estimated that the population in the Tirneevin sub-site (GY07) falls within an interval class of 1,001-3,000 plants
Vegetation structure: female fruiting plants	Percentage in a representative number of 5m x 5m monitoring stops or in an *ad hoc* count of 50 plants	Fruiting females comprise at least 10% of juniper plants rooted in plot in at least 50% of stops or in an *ad hoc* count of 50 plants	Attribute and target based on Cooper et al. (2012) and O'Neill and Martin (2018). In the Tirneevin sub-site (GY07) in Coole-Garryland Complex SAC, it was estimated that 21% of juniper plants were fruiting when surveyed in 2017 by O'Neill and Martin (2018)
Vegetation structure: seedling recruitment	Presence in a representative number of 5m x 5m monitoring stops	At least one seedling recorded in at least one monitoring stop	Attribute and target based on O'Neill and Martin (2018). Juniper seedlings are defined as plants less than 15cm high that are still flexible and single-stemmed, or with only two branches at most. One seedling was recorded by O'Neill and Martin (2018) in the Tirneevin sub-site (GY07) in the SAC
Vegetation structure: live juniper	Percentage in a representative number of 5m x 5m monitoring stops or across the site as a whole	At least 90% of juniper plants rooted in plot alive in at least 75% of stops or across the site as a whole	Attribute and target based on Cooper et al. (2012) and O'Neill and Martin (2018). In the Tirneevin sub-site (GY07), more than 10% of plants recorded by O'Neill and Martin (2018) were dead due to prolonged flooding
Vegetation composition: negative indicator species	Percentage in a representative number of 5m x 5m monitoring stops	Total cover of negative indicator species to be less than 10% in at least 50% of stops	Attribute and target based on O'Neill and Martin (2018) where the list of negative indicator species is also presented
Physical structure: germination niches	Percentage in a representative number of 5m x 5m monitoring stops	At least 5% bare soil and/or at least 5% bare rock in at least 25% of stops	Attribute and target based on O'Neill and Martin (2018). Bare soil is important as a germination micro-site and bare rock can also contribute, particularly at the soil-rock interface and in limestone pavement grikes. In the Tirneevin sub-site (GY07), a mean of 0.2% bare soil and 23% bare rock was recorded in six monitoring stops in the habitat by O'Neill and Martin (2018)

Formation structure: browning/die-back of plants	Percentage of juniper cover in a representative number of 5m x 5m monitoring stops	Browning or dead juniper branches (excluding fully dead plants) comprise no more than 20% of total juniper cover in plot in at least 75% of stops	Attribute and target based on O'Neill and Martin (2018). In the Tirneevin sub-site (GY07), a mean of 5% of total juniper cover across the six monitoring stops was browning in 2017 (O'Neill and Martin, 2018)
Formation structure: evidence of browsing and bark stripping	Occurrence across a representative number of 5m x 5m monitoring stops	No browsing of juniper shoot tips, and trunk bark stripping evident in no more than 10% of juniper shrubs in at least 75% of stops	Attribute and target based on O'Neill and Martin (2018). This attribute concerns bark stripping by animals. Bark stripping or damage from abrasion by rock is not included here. It should be noted, however, that distinguishing between the two may be difficult. No evidence of juniper browsing was recorded in the habitat in the Tirneevin sub-site (GY07) by O'Neill and Martin (2018)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species on the Flora (Protection) Order, 2015 and/or Red Lists (Byrne et al., 2009; Regan et al., 2010; Lockhart et al., 2012; Wyse Jackson et al., 2016, etc.; see Nelson et al., 2019, 2021)

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)

To restore the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	The total current area of orchid-rich calcareous grassland in Coole-Garryland Complex SAC is not known. Where it occurs, it is in small pockets, forming part of a mosaic scattered over the pavement, or within the turlough basin. The habitat occurs in intimate association with these other Annex I habitats in this SAC: Limestone pavements* (habitat code 8240) and Turloughs* (3180). Therefore, these habitats cannot easily be mapped or considered separately. Conservation objectives for these habitats should be used in conjunction with each other as appropriate. The best examples of orchid-rich calcareous grassland in the SAC are seen at the very north-west and south-west of the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes on habitat area above
Vegetation composition: positive indicator species	Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least two 'high quality' positive indicator species present in stop or within 20m of stop	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the lists of positive and high quality indicator species are presented. These documents should be consulted for further details. Indicator species which have been recorded include dropwort (*Filipendula vulgaris*), spring sedge (*Carex caryophyllea*), carline thistle (*Carlina vulgaris*), lady's-bedstraw (*Galium verum*), bird's-foot trefoil (*Lotus corniculatus*), quaking grass (*Briza media*) and glaucous sedge (*Carex flacca*). Orchids include pyramidal orchid (*Anacamptis pyramidalis*), common spotted-orchid (*Dactylhoriza fuchsii*), heath spotted-orchid (*D. maculata*), fragrant orchid (*Gymnodenia conopsea*), fly orchid (*Orchis insectifera*) and greater butterfly-orchid (*Platanthera chlorantha*). The presence of blue moor-grass (*Sesleria caerulea*) contributes to the diversity of this community
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover of an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the list of negative indicator species is presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation composition: woody species and bracken	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species (except certain listed species) and bracken (*Pteridium aquilinum*) not more than 5%	Woody species that can occur above 5% cover are juniper (*Juniperus communis*), burnet rose (*Rosa spinosissima*), mountain avens (*Dryas octopetala*) and hoary rock-rose (*Helianthemum oelandicum*). However, cover of these species above 25% may indicate transition to another Annex I habitat such as Alpine and Boreal heaths (4060) or *Juniperus communis* formations (5130). Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation structure: broadleaf herb:grass ratio	Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Broadleaf herb component of vegetation between 30% and 40% may be allowed to pass on expert judgement (Martin et al., 2018)

Vegetation structure: sward height	Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 5cm and 40cm tall	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation structure: litter	Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: bare soil	Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: grazing or disturbance	Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

8240 Limestone pavements*

To restore the favourable conservation condition of Limestone pavements* in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Limestone pavements* surrounds basins of Turloughs* (Annex I habitat code 3180) in Coole-Garryland Complex SAC and occurs in mosaic with the Annex I habitats Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (habitat code 6210), *Juniperus communis* formations on heaths or calcareous grasslands (5130), *Taxus baccata* woods of the British Isles* (91J0), as well as calcareous heath, scrub and other woodland habitats. Therefore, these habitats cannot easily be mapped or considered separately. Conservation objectives for all the Annex I habitats should be used in conjunction with each other as appropriate. Wilson and Fernandez (2013) mapped the indicative area of limestone pavement in the SAC, including mosaics with associated habitats, as 260.6ha (see map 6)
Distribution	Occurrence	No decline, subject to natural processes. Map 6 shows the indicative distribution, including mosaics with other habitats	See the notes for habitat area above. Distribution based on Wilson and Fernandez (2013). This habitat can be split into exposed pavement and wooded pavement. In this SAC, the habitat exhibits good examples of smooth pavement and incorporates all successional stages from exposed limestone pavement through the continuum to pavement dominated by juniper (*Juniperus communis*) scrub and yew (*Taxus baccata*), pavement dominated by hawthorn (*Crataegus monogyna*) scrub, and pavement dominated by mature woodland. The best examples of exposed pavement occur at the very south, south-west and north-west tip of the SAC (NPWS internal files)
Vegetation composition: positive indicator species	Number at a representative number of monitoring stops	At least seven positive indicator species present	Positive indicator species for exposed and wooded pavement are listed in Wilson and Fernandez (2013). Positive indicator species recorded on exposed pavement in the SAC include burnet rose (*Rosa spinosissima*), blue moor-grass (*Sesleria albicans*), herb-robert (*Geranium robertianum*) and rusty-back fern (*Asplenium ceterach*). Positive indicator species recorded on wooded pavement include hazel (*Corylus avellana*) and ash (*Fraxinus excelsior*) (NPWS internal files)
Vegetation composition: bryophyte layer	Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement	Attribute and target based on Wilson and Fernandez (2013)
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%	Negative indicator species are listed in Wilson and Fernandez (2013). Negative indicator species for wooded pavement overlap with non-native species (below). In this SAC, negative indicator species recorded on wooded pavement in the habitat include sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and some conifer species (NPWS internal files)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1% on exposed pavement; on wooded pavement not more than 10% with no regeneration	Attribute and target based on Wilson and Fernandez (2013)
Vegetation composition: scrub	Percentage at a representative number of monitoring stops	Scrub cover no more than 25% of exposed pavement	Attribute and target based on Wilson and Fernandez (2013)

Vegetation composition: bracken cover	Percentage at a representative number of monitoring stops	Bracken (*Pteridium aquilinum*) cover no more than 10% on exposed pavement	Attribute and target based on Wilson and Fernandez (2013)
Vegetation structure: woodland canopy	Percentage at a representative number of monitoring stops	Canopy cover on wooded pavement at least 30%	Attribute and target based on Wilson and Fernandez (2013)
Vegetation structure: dead wood	Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Physical structure: disturbance	Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement	Attribute and target based on Wilson and Fernandez (2013). The habitat is relatively undisturbed, indicated by the occurrence of pedunculate oak (*Quercus robur*) and (*Juniperus communis*) which are slow colonisers and sensitive to disturbance (NPWS internal files). However, a small amount of limestone extraction has been reported in part of the habitat near Garryland turlough in the SAC (Waldren, 2015)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species on the Flora (Protection) Order, 2015 and/or Red Lists (Byrne et al., 2009; Regan et al., 2010; Lockhart et al., 2012; Wyse Jackson et al., 2016, etc.; see Nelson et al., 2019, 2021) and other rare or localised species, as well as archaeological and geological features, which often support distinctive species. In some areas in this SAC, dwarf pedunculate oak (*Quercus robur*) woodland grows on limestone pavement which is unusual in this habitat (NPWS internal files)

91J0 *Taxus baccata* woods of the British Isles*

To restore the favourable conservation condition of *Taxus baccata* woods of the British Isles* in Coole-Garryland Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. See map 7	*Taxus baccata* woods of the British Isles* occurs in Coole-Garryland Complex SAC. Coole-Garryland is state-owned and protected as a Nature Reserve. At Garryland, a large complex of woodland and turlough habitats, yew woodland occurs on outcropping limestone within an extensive area of mixed deciduous woodland. As part of the National Survey of Native Woodlands (NSNW), the sub-site Garryland Wood (NSNW site code 1594) was surveyed by Perrin et al. (2008); its conservation assessment score was ranked as joint first nationally. Garryland (code 1594) was also included in a national monitoring survey (Cross and Lynn, 2013; Daly et al., 2023). Map 7 shows the minimum area of yew woodland within the SAC, which is estimated to be 3.22ha (Daly et al., 2023). It is important to note that further unsurveyed areas of the habitat may be present within the SAC
Habitat distribution	Occurrence	No decline. The surveyed yew woodland at Garryland is shown on map 7	Distribution based on Daly et al. (2023). It is important to note that further unsurveyed areas of the habitat may be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion. Garryland Wood (NSNW site code 1594) is a large site, comprising approximately 178ha (Perrin et al., 2008)
Woodland structure: cover and height	Percentage; metres; centimetres	Total canopy cover at least 30%; median canopy height at least 10m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	The target aims for a diverse structure with a canopy containing mature trees, shrub layer with semi-mature trees and shrubs, and well-developed field layer (herbs and dwarf shrubs) and ground layer (bryophytes). Assessment criteria are described in Daly et al. (2023) and Cross and Lynn (2013). At Garryland (code 1594), the canopy averages c.13m with dense cover of both yew and beech (*Fagus sylvatica*) in places. The shrub and field layer are very poorly developed or almost absent, but the bryophyte layer is well developed. The shrub and field layer are unlikely to develop further without a more open canopy. Removal of selected beech trees would open up the canopy and encourage shrub and field layer development (Cross and Lynn, 2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	See Perrin et al. (2008), Cross and Lynn (2013), Daly et al. (2023) and NPWS internal files for further details. See also the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/ivc-classification-explorer)
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes of yew (*Taxus baccata*) and other native tree species occur in adequate proportions to ensure survival of woodland canopy	Yew (*Taxus baccata*) regenerates poorly under its own canopy, but can regenerate under a canopy of other species or in the open if competition from the field layer is not too strong. At Garryland (code 1594), there is a small amount of yew regeneration in the mixed deciduous woodland adjacent to the yew woodland stands (Cross and Lynn, 2013)

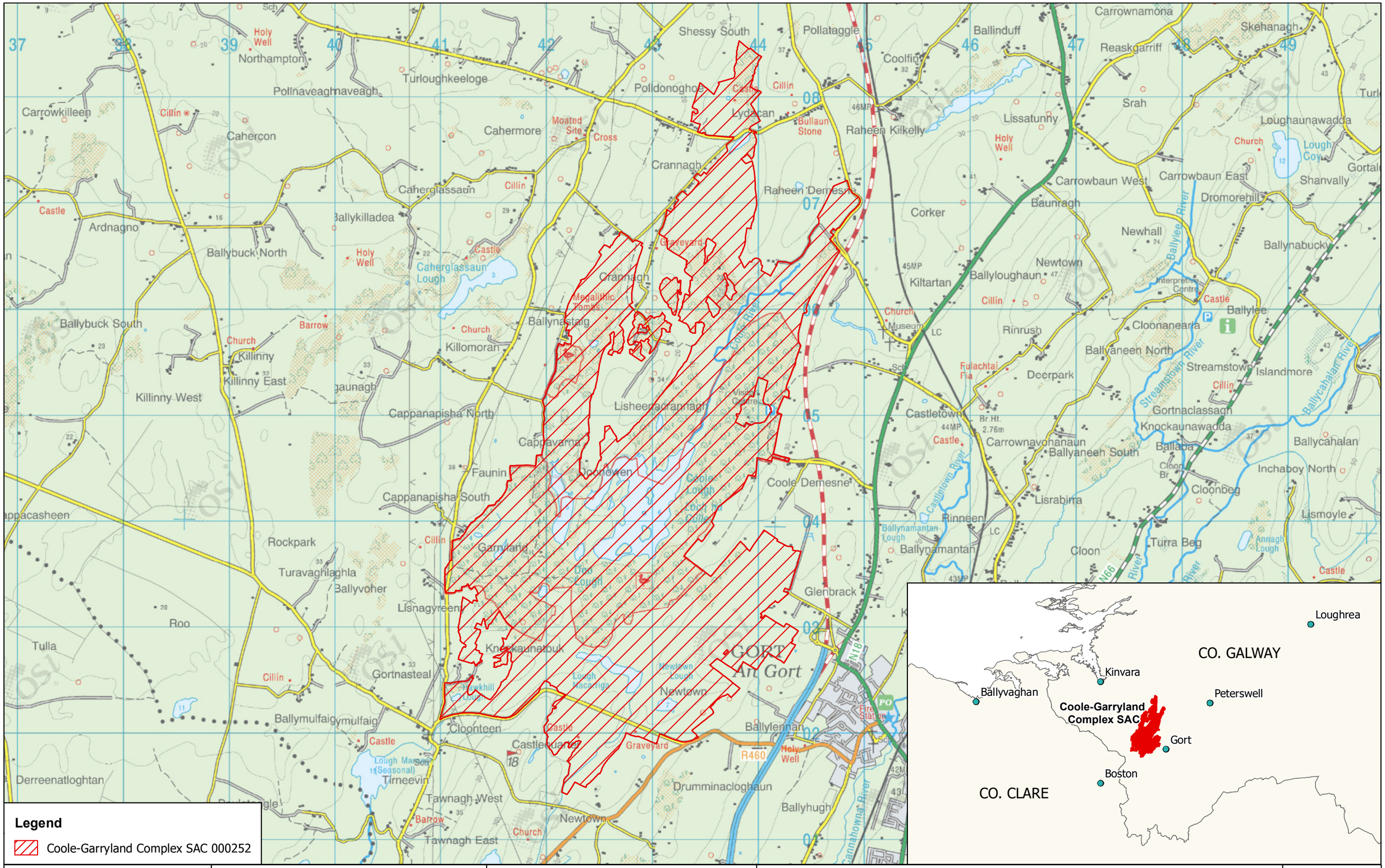
Woodland structure: dead wood	Number per hectare	At least 19 stems/ha of dead wood at least 20cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem. Dead wood comprises old senescent trees, standing dead trees, fallen dead wood (including large branches) and rotten stumps of any tree species. Assessment criteria are described in Daly et al. (2023) and Cross and Lynn (2013)
Woodland structure: veteran trees	Number per hectare	No decline	Veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence; population size	No decline in distribution and, in the case of red listed and other rare or localised species, population size	Includes ancient or long-established woodlands, archaeological and geological features as well as red listed and other rare or localised species. The yew woodland at Garryland comprises Long-Established Woodland (I) (i.e. continuously wooded since the 1st edition OS maps of 1830-44, these stands may potentially be of ancient origin, but no positive evidence of antiquity was found in older documentation) (Perrin and Daly, 2010). Rare Myxomycete species have been recorded from woodlands within the SAC (NPWS internal files). Notable species of saproxylic beetles have been recorded from Garryland Wood (Alexander and Anderson, 2012). The Coole-Garryland turlough system is considered to be the most diverse in the country, for both its physiography and vegetation; it is unique in that it is so closely associated with woodland. The woodland is extremely diverse in terms of both habitat and species (NPWS internal files). See also the conservation objective for Turloughs* (3180) in this volume
Woodland structure: indicators of overgrazing	Occurrence	All four indicators of overgrazing absent	Yew (*Taxus baccata*) is highly susceptible to browsing and bark stripping (Thomas and Polwart, 2003). There are four indicators of overgrazing within 91J0*: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, and severe recent bark stripping (Daly et al., 2023)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover at least 90% of canopy; yew (*Taxus baccata*) cover at least 50% of canopy	Species reported in Perrin et al. (2008), Cross and Lynn (2013), Daly et al. (2023) and NPWS internal files. The canopy of the yew woodland at Garryland is dominated by yew with some ash (*Fraxinus excelsior*), pedunculate oak (*Quercus robur*) and beech (*Fagus sylvatica*), with dense cover of both yew and beech in places (Cross and Lynn, 2013)
Vegetation composition: typical species	Occurrence	Yew (*Taxus baccata*) present; at least 6 positive indicator species for 91J0* woodlands present	A variety of typical native species should be present. Yew (*Taxus baccata*) is the only target species for 91J0*. Positive indicator species for 91J0* are listed in Daly et al. (2023) and Cross and Lynn (2013)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	Negative indicator species (i.e. any non-native species, including herbaceous species) absent or under control. The canopy of the yew woodland at Garryland contains dense cover of beech in places (Cross and Lynn, 2013), with extremely high numbers of beech seedlings in places. Due to the presence of Ash Dieback disease, careful management is needed to ensure that any light gaps created are colonised by native species rather than invasive non-native species at this site (Daly et al., 2023)

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the Favourable conservation condition of the Lesser Horseshoe Bat in Coole-Garryland Complex SAC, which is defined by the following attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 218 bats for the summer roost with roost id. 226 (in NPWS database). See map 8	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for Lesser Horseshoe Bat (*Rhinolophus hipposideros*). NPWS endeavour to conduct annual counts at each qualifying roost. Qualified means from the 2019-2023 summer data have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count were removed and the mean of the remaining years was calculated. This mean is set as the target figure for the summer roost. See the conservation objectives supporting document for Lesser Horseshoe Bat (NPWS, 2024) for further information
Summer roosts	Condition	No decline	Coole-Garryland Complex SAC has been selected for Lesser Horseshoe Bat because of the presence of one internationally important summer roost (roost id. 226 in NPWS database). Damage or disturbance to the roost or to the habitat immediately surrounding the roost will lead to a decline in its condition (Marnell et al., 2022). See the conservation objectives supporting document for Lesser Horseshoe Bat (NPWS, 2024) for further information
Auxiliary roosts	Number and condition	No decline	Lesser Horseshoe Bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known Lesser Horseshoe Bat roosts is available on the National Biodiversity Data Centre website. It is important to note that further unrecorded roosts may also be present within this SAC. See the conservation objectives supporting document for Lesser Horseshoe Bat (NPWS, 2024) for further information
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roosts	Lesser Horseshoe Bat normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 8 which shows a 2.5km zone around the above roosts and identifies potential foraging grounds. See the conservation objectives supporting document for Lesser Horseshoe Bat (NPWS, 2024) for further information
Linear features	Kilometres	No significant loss within 2.5km of qualifying roosts. See map 8	This species follows commuting routes from its roost to its foraging grounds. Lesser Horseshoe Bat will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008). See the conservation objectives supporting document for Lesser Horseshoe Bat (NPWS, 2024) for further information

Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5km of those roosts. See map 8	Lesser Horseshoe Bat are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats and reducing reproductive success at a population level (Schofield, 2008; Stone, 2013). See the conservation objectives supporting document for Lesser Horseshoe Bat (NPWS, 2024) for further information



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MAP 1:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3.02
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Map version 2
Date: March 2024

Coole-Garryland Complex SAC 000252

Coole-Garryland SPA 004107

Legend

- Coole-Garryland Complex SAC 000252
- Coole-Garryland SPA 004107

Ordnance Survey Ireland 2018

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MAP 2:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
OVERLAPPING SITE

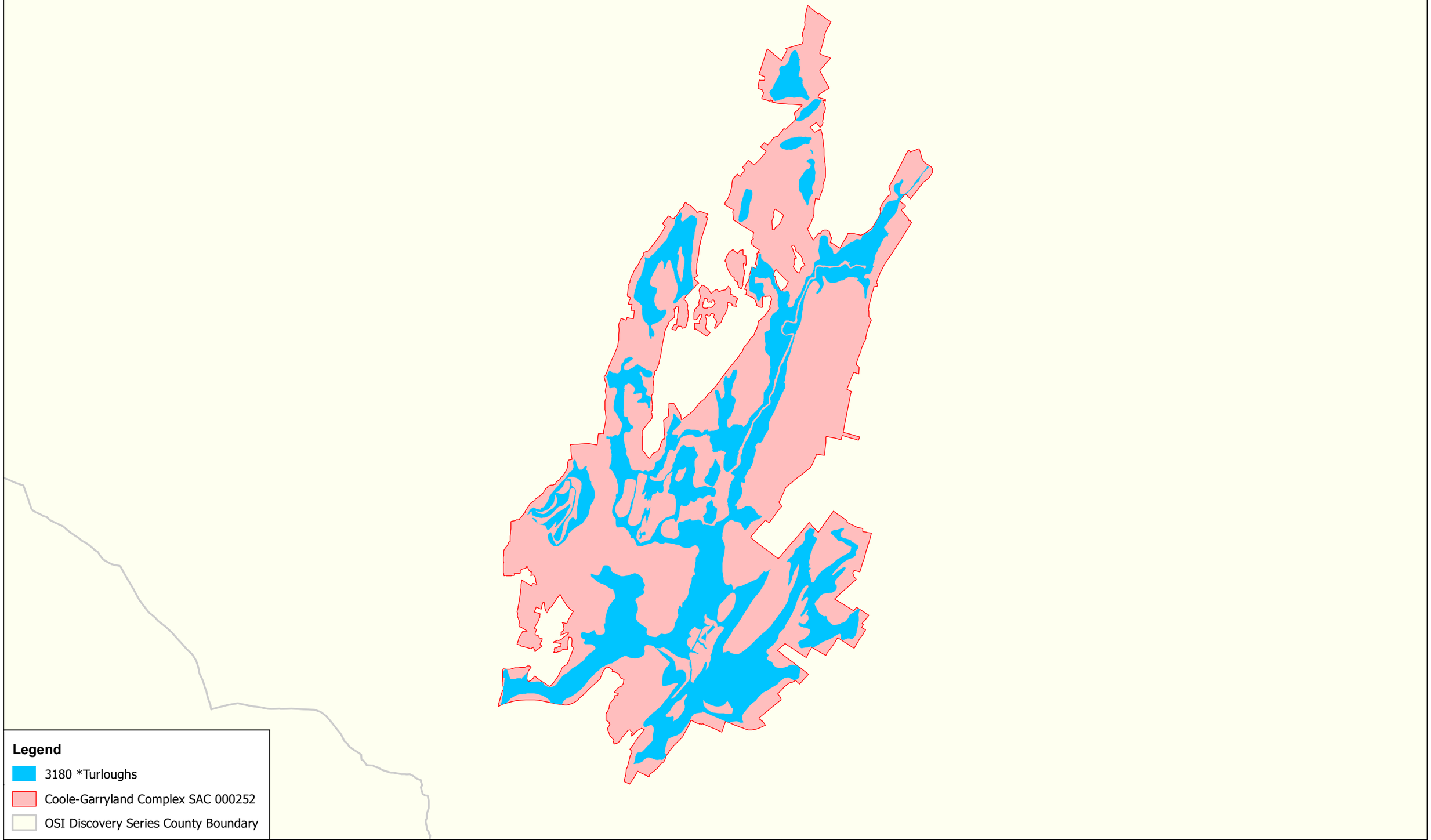
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3.02
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Map version 2
Date: March 2024



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MAP 3:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
TURLOUGHS

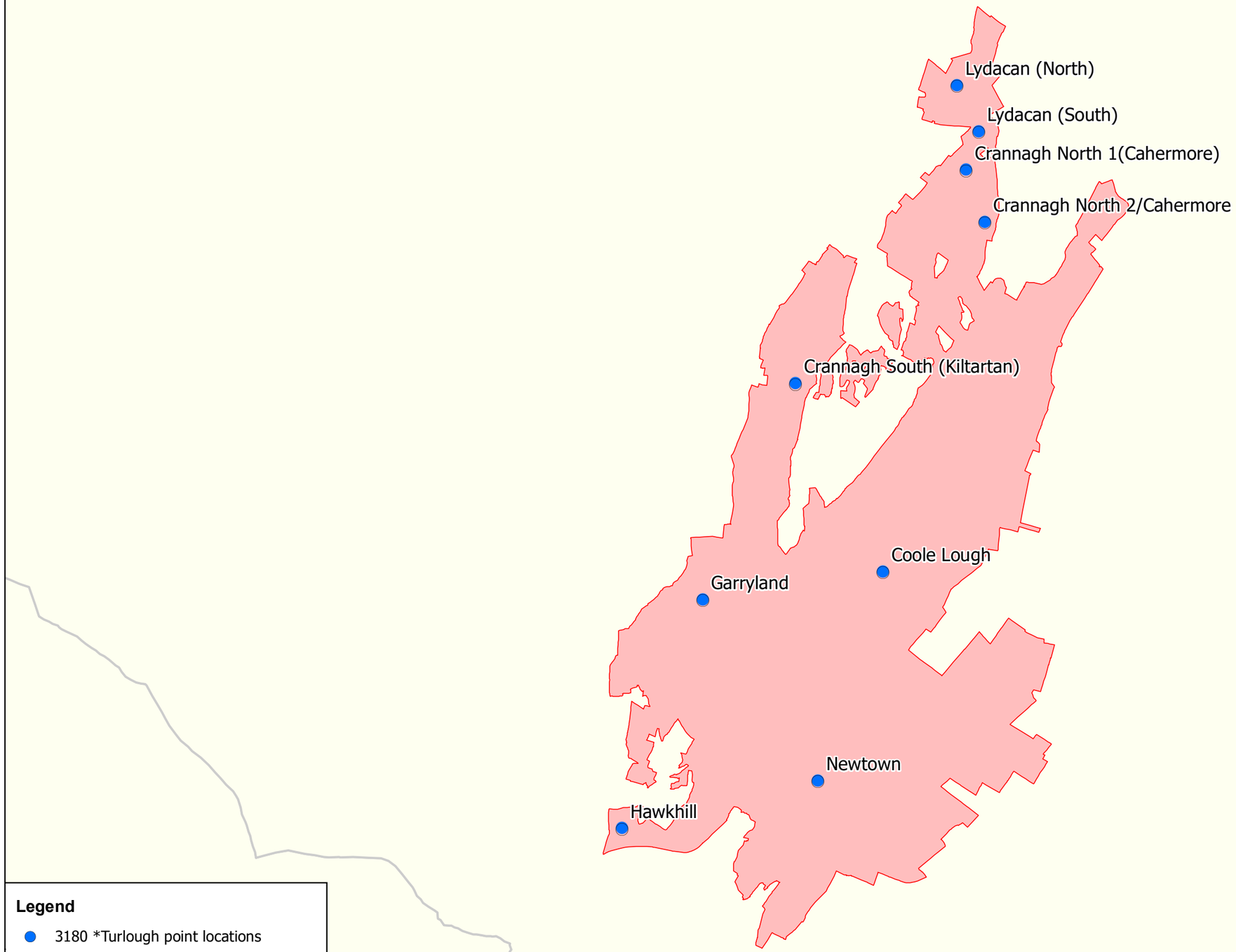
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Date: December 2021



Legend

- 3180 *Turlough point locations
- Coole-Garryland Complex SAC 000252
- OSI Discovery Series County Boundary

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MAP 4:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
TURLOUGH POINT LOCATIONS

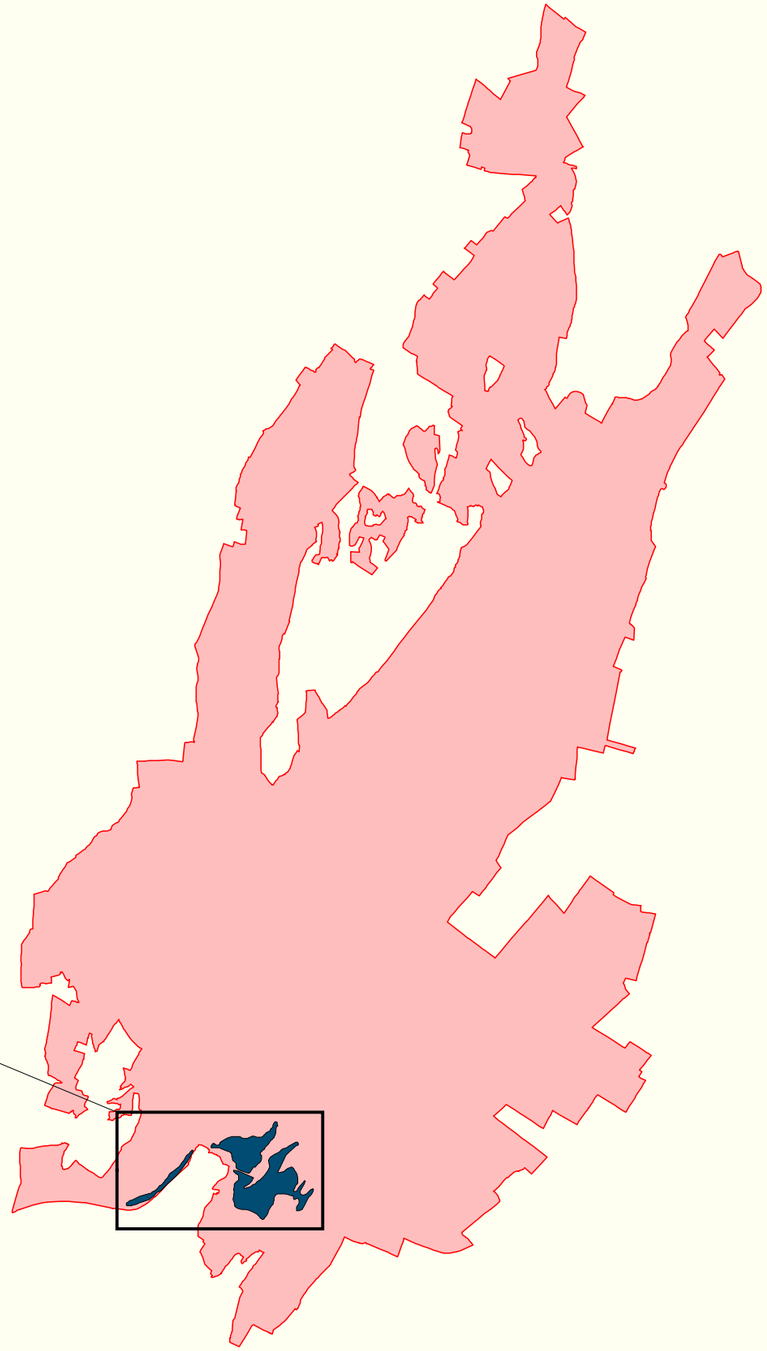
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Date: December 2021



Legend

- 5130 *Juniperus communis* formations on heaths or calcareous grasslands
- Coole-Garryland Complex SAC 000252
- OSI Discovery Series County Boundary

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Department of Housing, Local Government and Heritage

MAP 5:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
JUNIPER

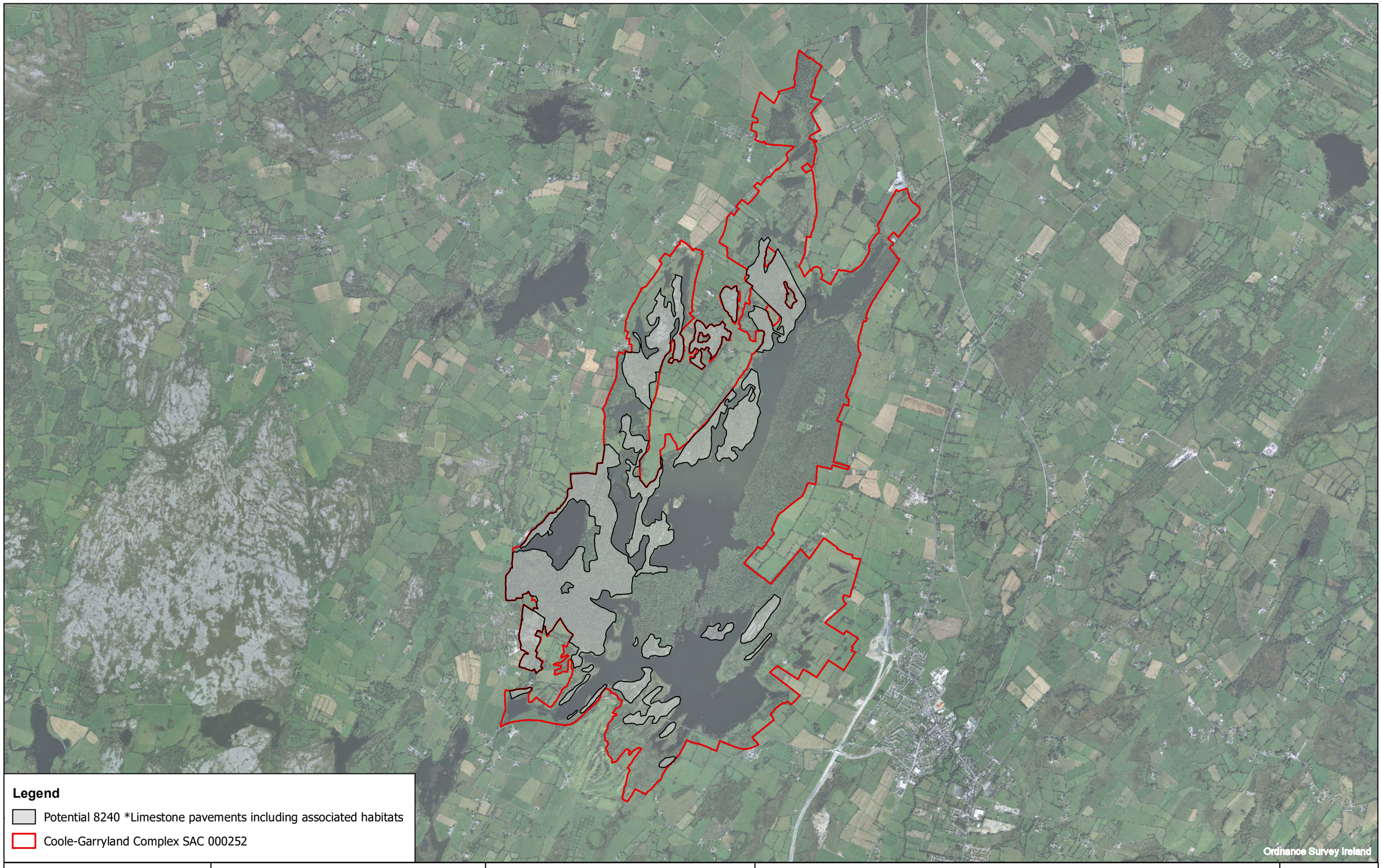
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3.
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Date: November 2021



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MAP 6:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
LIMESTONE PAVEMENT

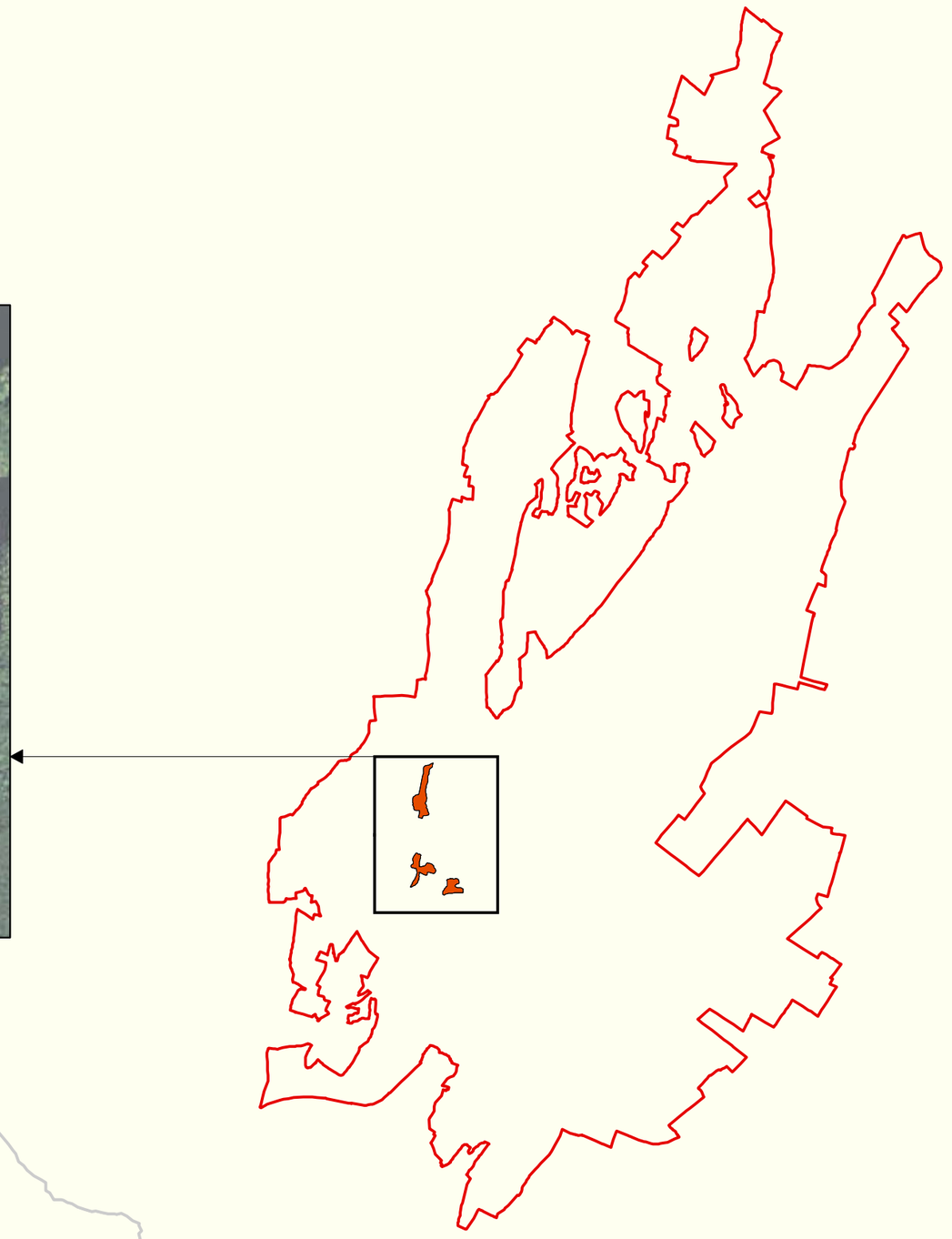
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3.
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Date: November 2021



Legend

- 91J0 **Taxus baccata* woods of the British Isles
- Coole-Garryland Complex SAC 000252
- OSI Discovery Series County Boundary

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MAP 7:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3.
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Date: November 2021

Roost ID 226

Legend

- Coole-Garryland Complex SAC 000252
- OSI Discovery Series County Boundary

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

- Roost Location
- Foraging Range (2.5km)
- Potential Foraging Grounds

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MAP 8:
COOLE-GARRYLAND COMPLEX SAC
CONSERVATION OBJECTIVES
LESSER HORSESHOE BAT

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000252; version 3.02
CO. GALWAY

0 0.25 0.5 1 Kilometre

N

Map version 1
Date: March 2024